1999 Science to Achieve Results Program (STAR) Announcement on:

- **Integrated Assessment of the Consequences of Climate Change**
- **Ecological Indicators**
- **Regional Scale Analysis and Assessment**
- **Urban Air Toxics**
- **Mercury: Transport and Fate through a Watershed**

SEE INDIVIDUAL CATEGORIES FOR APPLICATION SUBMISSION CLOSING DATES

Contents

RESEARCH TOPICS	
INTEGRATED ASSESSMENT OF THE POSITIVE AND NEGATIVE CONSEQUENCES ON THE UNITED STATES OF CLIMATE CHANGE AND CLIMATE VARIABILITY	2
ECOLOGICAL INDICATORS RESEARCH	4
REGIONAL SCALE ANALYSIS AND ASSESSMENT	6
URBAN AIR TOXICS	7
MERCURY: TRANSPORT AND FATE THROUGH A WATERSHED	9
Eligibility	11
Standard Instructions for Submitting an Application	11
Sorting Codes	11
The Application	11
How to Apply	12
Guidelines, Limitations, and Additional Requirements	14
Review and Selection	14
Proprietary Information	14
Funding Mechanism	15
Contacts	15

Introduction

In this announcement the U.S. Environmental Protection Agency (EPA), Office of Research and Development (ORD), invites research grant applications in the following areas of special interest to its mission:

1. Integrated Assessment of the Consequences of Climate Change
2. Ecological Indicators
3. Regional Scale Analysis and Assessment
4. Urban Air Toxics
5. Mercury: Transport and Fate through a Watershed

This invitation provides relevant background information, summarizes EPA's interest in the topic areas, and describes the application and review process.

Background

This Request for Applications (RFA) describes programmatic areas which are a part of the EPA STAR (Science to Achieve Results) 1999 solicitation. Additional program topic areas and joint programs with the National Science Foundation and other agencies will be announced separately.

EPA Mission and R & D Strategy

The mission of EPA is to protect both environmental quality and human health through effective regulations and other policy initiatives. Achievement of this mission requires the application of sound science to assessment of environmental problems and to evaluation of possible solutions. A significant challenge is to support both long-term research that anticipates future environmental problems as well as research that fills gaps in knowledge relevant to meeting current Agency goals. Requests for Applications issued by the STAR Program are an important mechanism for promoting a sound scientific foundation for environmental protection.

EPA's research programs focus on reduction of risks to human health and ecosystems and on the reduction of uncertainty associated with risk assessment. Through its laboratories and through grants to academic and other not-for-profit institutions, EPA promotes research in both domains, according the highest priority to those areas in which risk assessors are most in need of new concepts, methods, and data. EPA also fosters the development and evaluation of new risk reduction technologies across a spectrum, from pollution prevention through end-of-pipe controls to remediation and monitoring. In all areas, EPA is interested in research that recognizes issues relating to environmental justice, the concept of achieving equal protection from environmental and health hazards for all people without regard to race, economic status, or culture.

EPA's extramural research grant program, the STAR Program, is administered by ORD's National Center for Environmental Research and Quality Assurance (NCERQA). The individual topic areas are discussed below.

RESEARCH TOPICS

1. INTEGRATED ASSESSMENT OF THE POSITIVE AND NEGATIVE CONSEQUENCES ON THE UNITED STATES OF CLIMATE CHANGE AND CLIMATE VARIABILITY

BACKGROUND: A major responsibility of the U.S. Global Change Research Program (USGCRP) is to quantify the potential consequences of climate change and climate variability for human health, natural ecosystems, and economic activity. Both positive and negative consequences need to be identified. The enabling legislation of the Global Climate Research Act of 1990 mandates that the USGCRP ". . . prepare and submit to the President of the United States an assessment which--

(1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings;

(2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biodiversity; and

(3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years."

To fulfill this mandate, the USGCRP is conducting the first National Assessment of the "Potential Consequences of Climate Variability and Change on the United States" that will deliver a report to Congress in January 2000. The assessment will contain a National Synthesis Report, 19 Regional Assessments, an assessment of the potential consequences of climate variability and change for Native Americans, and five Sectoral Studies focusing on human health, coastal zones, water resources, agriculture and forests (see http://www.USGCRP.gov). This assessment process will be periodically repeated as new scientific information becomes available.

In addition to supporting the National Assessment Process, the Environmental Protection Agency (EPA) supports research to develop and implement methodologies for the integrated assessment of the potential consequences of climate variability and change on human health, ecosystems, and economic systems. A first set of regional-scale integrated assessments was funded by EPA's STAR Program in Fiscal Year 1996 (FY 96). Five competitive research grants were funded. These assessments were sector/system specific (e.g., water resources, agriculture, public health, etc.) and integrated "vertically" from climate scenarios/models to hydrologic models, ecosystem models, and other physical/biological models, as appropriate, and then finally to economic models.

The purpose of this new solicitation by the EPA is to continue support of research that further advances the development of approaches for conducting integrated assessments of the potential consequences of climate variability and change on the United States. The intent of this second solicitation is to encourage assessments that integrate "horizontally" as well as vertically; i.e., assessments that assess the consequences of climate variability and change across sectors/systems. Also, it is intended that these assessments focus on a finer geographic scale than the first-round of FY 96 STAR grants.

DESCRIPTION: Integrated assessments are studies which investigate individual components of a larger system (e.g., changes in regional climate; changes in the hydrologic cycle; physical and biological effects; economic impacts) and then show how changes in the individual components interact and affect other parts of the system. The objective of this solicitation is to conduct a series of integrated assessments of the potential consequences of climate variability and change on small geographic locations (i.e., a sub-regional level) within the United States. They should identify and illuminate climate change impacts

that are best assessed at fine geographic scales and that are of potentially significant environmental, social, and/or economic importance. (These assessments are not intended to duplicate the regional assessments that are currently being conducted as part of the first USGCRP National Assessment Process.)

These assessments must integrate both "horizontally" across sectors and "vertically" from the climate system through to socioeconomic impacts. By integrating horizontally, these assessments should begin to identify and illuminate climate change impacts which when considered jointly are likely to identify important interactions that would alter conclusions about the vulnerability of a locality or resource to climate change. The assessments should integrate across impact categories, sectors and systems such as human health, air quality, water resources (both quantity and quality), ecosystems, wildlife and biodiversity, agriculture and aquaculture, forests and vegetation, coastal zones, tourism and recreation, social systems, and economic systems. For example, a proposed assessment might examine the potential consequences of climate variability and change on the San Francisco Bay area. Such an assessment might integrate "horizontally" to capture the potential impacts on coastal areas (due to sea level rise), human health, urban air quality, urban drinking water supplies, agriculture, wetlands, freshwater fisheries and recreational fishing, and hydropower. It would not be sufficient to link changes in climate to changes in forests and human uses for the forests, such as local opportunities for viewing selected bird species; it would also be necessary to extend the assessment to integrate the effects of other sectors/systems, such as water resources, agriculture, and the local economy.

This assessment would also integrate "vertically" from climate scenarios/models to hydrologic models, ecosystem models, and other physical/biological models, as appropriate, and then finally to economic models. It is not sufficient to provide an assessment of the potential physical changes in the environment that might result from climate variability and change; it is also necessary to assess the potential consequences for human uses of the environment and for society.

Whereas the previous 1996 Request for Applications (RFA) focused on regions such as the southeastern U.S. or the corn belt, the geographic areas that might be considered for this RFA include large or small cities, such as Miami, FL, Des Moines, IA or Raleigh, NC; National Parks such as the Everglades, Rocky Mountain or Olympia; coastal areas such as Waquoit Bay, Mobile Bay or Gray's Harbor; small river basins such as Big Darby Creek, OH; or native and tribal lands. For the purposes of this RFA, we are not requesting proposals for large geographic areas, such as the mid-Atlantic region or the Mississippi watershed.

In addition, the assessments should be structured so that they address the following questions (also being addressed in the USGCRP National Assessment Process):

- What are the current conditions of resources, environmental/socioeconomic stresses, and issues of concern for the geographic area under investigation?
- How might climate variability and change exacerbate or ameliorate these conditions?
- What coping options exist that can build resilience to current environmental stresses, and also possibly lessen the impacts of climate variability and change (or take advantage of new opportunities presented by climate variability and change)?
- What are the priority research and information needs that can better prepare policy makers to reach wise decisions related to climate variability and change?
- What research is most important to complete over the short term? Over the long term?

ADDITIONAL CONSIDERATIONS: The Principal Investigator must partner with a local stakeholder group that has particular interest in the outcome of the assessment. For example, this might be a Mayor's Office in a small municipality, a river commission within a watershed, or a non-governmental organization (NGO). A letter of support and cooperation from the partner for the assessment must accompany the application. In addition, an effective strategy for communicating the results of the assessment (the positive and negative consequences of climate change and variability across sectors) to affected stakeholders, and the public at large, must be included. The latter is not to exceed two pages and must be included within the 15 pages of allowable text for the proposal.

Funding: Up to $6 million is expected to be available in fiscal year 1999 for awards in this program. A proposal may request up to $300,000 per year for up to 3 years, and may not exceed these funding levels or time.

2. ECOLOGICAL INDICATORS RESEARCH

Background: The quality of human existence is known to depend on interacting biotic and abiotic resources within spatially and temporally dynamic ecosystems. Activities associated with expanding human populations alter these complex interactions and threaten ecosystem integrity and sustainability. Broadly interpreted, integrity refers to the degree to which an ecosystem demonstrates a balanced, resilient community of organisms with biological diversity, species composition, structural redundancy, and functional processes comparable to that of natural habitats in the same region. Sustainability simply refers to the ability of an ecosystem to maintain ecological integrity over time.

A major responsibility of EPA is to assess and prevent adverse impacts of human activities on ecosystems. Monitoring programs, such as EPA's Environmental Monitoring and Assessment Program (EMAP), provide a means to detect existing and potential threats to ecosystem integrity. Yet, monitoring all components and interactions of an ecosystem is impractical, so certain variables must be used as indicators of ecosystem condition. In this context, an ecological indicator is a measure or index of measures that can be used to describe the condition of an ecosystem or one of its critical components or processes. The indicator may be related to, or derived from, measurements of variables that provide quantitative information on ecological structure and function. The indicator must be responsive to anthropogenic stressors and clearly linked to important societal values for the targeted resources. Ecological indicators may be used to address specific environmental values, to characterize ecosystem integrity and sustainability, or to identify sources of stress.

This request for applications is part of EMAP research and, as such, emphasizes the need for indicators useful in monitoring ecosystem integrity and sustainability, which will ultimately result in improved information for risk assessments. These may include indicators of current or future ecological condition and indicators that contribute information for understanding the causes of ecological impairment. Previous ecological indicator research has largely concentrated on indicators within a single resource type (i.e., wetlands, estuaries, lakes, streams, or forests), often at a single spatial scale and using a single sampling design. Research proposed for this solicitation should result in the development of indicators that (1) integrate between or among resource types, (2) incorporate multiple levels of biological organization (gene, organism, population, community, landscape), and (3) address multiple spatial scales (local, watershed, regional, national, global). Indicators may be individual field or remotely sensed measurements, indices, or model outputs. They may quantify biological condition relative to integrity and sustainability and/or quantify stressors to which the biota are exposed. Obviously, the resources, level of organization, spatial scale and type of indicator must be appropriate for the question (or environmental value) being addressed.

Different indicators employ a variety of measurements (e.g., organismal health, nutrient fluxes, population abundance, community diversity), each developed within the context of a particular discipline (pathology, limnology, ecology, etc.). Scientific advances in two disciplines, molecular genetics and landscape characterization, have provided incentive to further apply the tools of these disciplines to ecological indicator development. Thus, these areas are emphasized in this RFA as described in the Objectives and Priorities section. Interest in these disciplines is as follows:

Molecular genetics Techniques in molecular biology have been developed that potentially allow measurement of genetic diversity, both as an interspecies and an intraspeciies variable. The former may be applied as a community measure of biological diversity (an important characteristic of ecological integrity), whereas the latter may indicate the ability of a population to adapt to future environmental stresses. Thus, the identification and development of sensitive molecular and cellular indicators for monitoring and assessing changes in genetic diversity in response to environmental stressors is emphasized. Likely areas for research include, but are not limited to, multiple locus and single locus techniques to discriminate sources of genetic change in populations, development of indices of genetic instability, and evaluation of genetic heterozygosity of biota to determine vulnerability of extinction resulting from land use pattern changes. Unique molecular techniques and approaches for the study of genetic diversity that characterize genetic diversity in relation to ecosystem integrity and sustainability or evaluate different approaches for discriminating changes in genetic diversity are of interest. Although measured at the suborganismal level, it is necessary that the interpretation of genetic indicators be clearly relevant to ecosystem integrity or sustainability.

Landscape Characterization Spatial distributions of physical, biological or cultural features across a geographic area can now be reasonably documented over a wide range of scales with remotely-sensed geographical information techniques. Changes in the distribution of human populations and ecological resources can

dramatically alter fundamental ecological processes (e.g., flow of water, nutrients, energy, or biota) that influence ecosystem integrity and sustainability. Current needs include landscape indicators that are relatively scale independent (for conducting cross-scale landscape assessments); landscape indicators that quantify and characterize the geographic extent of key landscape attributes as they relate to a range of environmental values such as water quality, quality of the watershed, stream biological condition and habitat suitability; landscape indicators that are linked with hydrological and ecological process models (to evaluate risks to sustainability of environmental values over decades); and landscape indicators that link socio-economic models of future human use changes with key landscape structural and functional changes.

Although these disciplinary approaches offer broad opportunities for research, this emphasis is not intended to exclude other approaches that meet the objectives of the solicitation. All approaches will be considered in the priority described below.

Objectives and Priorities: The overriding objective of this topic area is to stimulate the development and evaluation of measurements, indices, and models that serve as indicators for improved monitoring and assessment of ecological integrity and sustainability for EMAP and other monitoring efforts. Research is solicited that leads to the development of indicators that characterize and quantify the integrity and sustainability of ecosystems. These may include indicators of current or future ecological condition and indicators that contribute information for understanding the causes of ecological impairment. Research priorities, beginning with the highest, are described below:

(1) The development of landscape characterization indicators that incorporate multiple resources and spatial scales. Indicators that are useful at regional and broader scales are emphasized over those intended primarily for local use.

(2) The development of indicators that span multiple resource types (e.g., forests, streams, wetlands, estuaries, rangelands). Any indicator that incorporates or integrates multiple scales and multiple levels of biological organization within the context of spanning multiple resources is also emphasized.

(3) The development of indicators within a single resource type (e.g., forests, streams, wetlands, estuaries, rangelands) that link different levels of biological organization or multiple spatial scales. The opportunity to apply cellular and molecular genetics techniques to address genetic diversity in conjunction with other levels of biological organization and multiple spatial scales is emphasized.

Geographic studies form one research component of EMAP. These are conducted at the regional level to test the proof of concept for monitoring and assessment recommended to EPA and other federal agencies for national implementation. The first major integrated geographic study by EMAP was initiated in the mid-Atlantic as a component of the Mid-Atlantic Integrated Assessment (MAIA). The next integrated geographic study is proposed for the western region of the U.S. (EPA Regions 8, 9, and 10) covering the coastal and estuarine, mountain, desert and Great Plains ecoregions. The range of ecological diversity across the western United States presents a challenging platform for developing integrated monitoring approaches. Thus, those proposals that focus on the development of ecological indicators for the western ecoregions will be given special consideration.

We solicit research on indicators that are applicable to ecological integrity and sustainability. Although indicators that employ measurements at any level of biological organization (including subcellular) are acceptable, the indicators must be directed toward an ecological interpretation. Each application must clearly identify and establish the linkage between the environmental value at risk, the assessment endpoint, and the proposed indicator.

Proposal Evaluation and Selection. Each proposal must clearly demonstrate a functional relationship of the indicator with anthropogenic stressors and the resource at risk. All selected proposals will be wholly funded for the duration of the project.

Funding: Approximately $8 million is expected to be awarded in fiscal year 1999 in this program area, depending on the availability of funds. The projected award range is $100,000 to $300,000/year with a duration of 2 or 3 years.

3. REGIONAL SCALE ANALYSIS AND ASSESSMENT

Introduction: Much of the ecological information generated today comes from intensive investigations of single sites or relatively small geographic areas. Yet many of the management questions being asked or ecological assessments being conducted are focused over broad geographic regions. The specific purpose of this solicitation by the STAR program on behalf of EPA's Environmental Monitoring and Assessment Program (EMAP) is to request proposals for research that lead to the development and demonstration of approaches to link site specific information with regional survey data and remote sensing imagery for conducting regional level ecological assessments. You may find extensive information about the EMAP program at http://www.epa.gov/EMAP.

Background: Ecologists have learned a great deal about systems and how they function by long-term studies of individual locations. Research conducted at the Long-Term Ecological Research (LTER) sites (funded primarily by the National Science Foundation) is outstanding among the many examples of these types of studies. A lingering question, however, from studies of this nature is the extent to which the findings from the single site can be extrapolated to broader areas. Determining the “representativeness” of the site is one approach toward creating regional scale analyses from the site studies. Knowledge of the important system drivers at the site is generally needed along with a knowledge of how those drivers are distributed over broader geographic areas containing apparently similar types of systems.

Another dimension of this concern comes in applying the multi-scale monitoring framework proposed by EMAP in 1990 and recently proposed by the White House Office of Science and Technology's Committee on Environment and Natural Resources (CENR) for its national monitoring and research framework. These frameworks suggest that monitoring and research must make use of a three tier approach to include (1) remote sensing, (2) sample surveys, and (3) intensive studies. Remote sensing can provide "complete coverage" of a geographic area. It can monitor changes in land-use and land cover that aid in interpreting changes in single resources, such as streams and wetlands. It can also provide estimates (through models) of important terrestrial features such as leaf area index (LAI). Sample surveys can characterize specific properties of ecological resources in a region through use of statistical sampling of a subset of the resource, followed by rigorous statistical inference back to the entire resource. The use of ground-based surveys broadens the range of ecological characteristics which can be measured, but surveys conducted over extensive spatial scales are often limited to measurements during a restricted portion of the year. Intensive studies at individual locations can provide even more detailed measurements of a wider range of system structure and function and often provide more temporally intensive data within a year. These studies are severely limited, however, in their spatial coverage.

All three approaches to research and monitoring are essential for an integrated assessment capability. Unfortunately, few examples exist which demonstrate how these different approaches and tools can be carefully linked to provide a more comprehensive assessment of a geographic region.

This is the third year of this announcement. You may access the NCERQA web site (www.epa.gov/ncerqa) to view the abstracts of proposals previously funded under this program.

Scope of Research: EPA’s STAR program solicits proposals for research on novel approaches for either conducting regional scale assessments by combining data from intensive investigations, regional surveys, and remotely sensed data or for novel approaches to determine the “representativeness” of an intensively studied site within a region. Priorities for funding will be:

(1) Development and demonstration of methodologies that link remote sensing, regional survey data, and intensively studied site research into an integrated ecological assessment. For example, how would one approach the problem of linking studies of carbon allocation at a specific forest research site with production estimates from forest inventory and analysis (FIA) surveys with remote sensing imagery of the region to provide a better description and understanding of forest productivity?

(2) Studies which demonstrate approaches for determining the “representativeness” of individual research locations. Lake Tahoe, for example, has been extensively studied but is also considered unique. How applicable are findings of research on Lake Tahoe to other lakes in western North America? If a less “unique” western lake were studied, how would one quantify its “representativeness” among other western lakes? Each of the LTER sites is located within a particular biome. How would one rigorously quantify how applicable the results from H.J. Andrews Experimental Forest, for example, are to other forested systems in the northwest?

A range of research may be appropriate for this request. Research which relies on existing data but demonstrates novel approaches for linking information from different sources would be appropriate. Other research might require additional primary data collection from any or all of the three tiers in order to demonstrate the approach proposed.

The outcome of this research should assist in answering some of the following questions:

How can the "representativeness" of an intensively studied site within a region be determined?

To what degree can intensive studies at smaller, traditional ecological scales be extrapolated to larger scales in which effects typical of regional anthropogenic stresses are expressed?

To what degree are assessments at fine scale spatially concordant with assessments made at coarse scale?

What are the implications of the demonstrated approach for designing research and monitoring at any or all of the three tiers? To what extent do the three tiers need to be designed in concert, or can they be independently designed and integrated after the fact?

Funding: Approximately $4 million is available for research under this RFA. It is anticipated that two types of proposals will be submitted with different funding requirements. The annual funding levels (for up to three years) will be up to $600,000/year, if primary data collection is required or $200,000/year if existing data bases are utilized.

4. Urban Air Toxics

Toxic chemicals found in the air pose serious public health risks, and there is a large amount of uncertainty surrounding the potential health effects, both cancer and non-cancer, associated with air toxics emissions from major stationary urban sources and mobile sources. Increased lifetime cancer risk from exposure to air toxics near sources may be as high as 1 in 1,000. Mobile sources account for approximately one third of air toxics emissions, major sources account for another third, and area sources for the remaining. The Clean Air Act (CAA) requires control of toxic air pollutant emissions from point and area sources. The Act prescribes a phased approach to regulate both major point sources and area sources of air toxics. A technology-based control program for major sources is mandated which uses Maximum Achievable Control Technology (MACT) for major sources emitting one or more of 188 listed hazardous air pollutants (HAPs). A comprehensive national strategy to control emissions of HAPs from area sources in urban areas is also mandated. The strategy must control 90% or more of at least the emissions of the 30 most hazardous toxic pollutants in urban areas (Table 1).

With much of the MACT program underway, research emphasis has turned to urban air toxics, including area sources and mobile sources. The CAA Amendments of 1990 require EPA to develop an “Area Source Program” that includes both a national strategy and a research program. The mandated research program is intended to provide the scientific basis for development of a comprehensive national strategy to control emissions of HAPs from area sources. The research program is to include “ambient monitoring,” “analysis to characterize the sources...and the contribution that such sources make to public health

risks," and "consideration of atmospheric transformation and other factors which can elevate public health risks."

The human health effects to be considered under the EPA research program include carcinogenicity, mutagenicity, teratogenicity, neurotoxicity, reproductive dysfunction, and other acute and chronic effects of urban air pollutants. The national strategy must "identify not less than 30" HAPs that "present the greatest threat to public health in the largest number of urban areas." The strategy is to be implemented by the year 2000 and must provide guidelines for controlling the area source emissions of the 30 identified HAPs, while simultaneously ensuring the reduction of at least 75% in the "incidence of cancer attributable to exposure to hazardous air pollutants." During the implementation phase, longer term activities are expected. Using emissions reductions as surrogates initially, qualitative risks from urban air toxics will be determined. Over time, however, more quantitative estimates of risk will be determined. The residual risk determinations occur 10 years after implementation of MACT standards (standards in 1992, 1994, 1997, and 2000). These risk reductions will also be counted toward the mandated 75% reduction in cancer incidence. Cumulative risks from numerous sources may dictate going beyond the source-category-by-source-category called for in CAA Section 112(d). The MACT and any future area source standards may not adequately address those risks without further actions. EPA will work with the states to achieve the risk reduction goals by developing in 2002 implementation guidance concerning risk assessment, monitoring, modeling, emissions inventory, and potential control options. In 2006 progress toward risk reduction goals will be assessed in the Integrated Urban Air Toxics Strategy Report to Congress.

A discussion of research needs for this area of interest is included in the EPA report "Urban Area Source Research Program: A Status Report on Preliminary Research" (EPA 600-R-95/027). A *Federal Register* notice (Vol. 63, No. 177, September 14, 1998, pp. 49240-49258) describes the Draft Integrated Urban Air Toxics Strategy and proposes a list of the 33 urban HAPs (Table 1) that could potentially pose the greatest threat to public health in the largest number of urban areas.

TABLE 1. Draft list of HAPs for the Integrated Urban Air Toxics Strategy

acetaldehyde
acrolein
acrylonitrile
arsenic compounds
benzene
bis(2-ethylhexyl)phthalate
1,3-butadiene
cadmium compounds
carbon tetrachloride
chloroform
chromium compounds
coke oven emissions
1,4-dichlorobenzene
1,3-dichloropropene
2,3,7,8-tetrachlorodibenzo-p dioxin (& congeners & TCDF congeners)
ethylene dibromide (dibromoethane)
ethylene dichloride (1,2-dichloroethane)
ethylene oxide
formaldehyde
hydrazine
lead compounds
manganese compounds
mercury compounds
methyl chloride
methylene diphenyl diisocynate (MDI)
methylene chloride (dichloromethane)
nickel compounds
polycyclic organic matter (POM)
propylene dichloride (1,2- dichloropropane)
quinoline
tetrachloroethylene (perchloroethylene)
trichloroethylene
vinyl chloride

Some of the critical research questions are highlighted below:

(1) What direct observational evidence (i.e., epidemiologic data) is there to link health effects with ambient levels of exposure to HAPs? Research should focus on the urban HAPs for which little information now exists and should use a multi-disciplinary approach to address both exposure and the resultant human health effects. Opportunities to leverage observational data from community-based studies already in place should be exploited.

(2) What approaches could be used to identify the most toxic HAPs and HAP mixtures in the urban air? What is the impact of mixtures of urban air pollutants on public health? Urban air pollution is a "soup" of chemicals; the chemicals come from many sources, are modified by atmospheric transformation, and may exhibit a variety of health effects. The risks posed by individual and mixtures of such toxic pollutants need to be characterized.

(3) Are there subpopulations that may be at increased risk from HAPs, due to higher exposures, or exposure to complex mixtures of pollutants, or increased susceptibility? What is the distribution of human exposures to the various HAPs, both for susceptible subpopulations and the general public? By what route and how effectively do the HAPs reach humans? Regarding health effects, identify and characterize the factors that affect inter individual variations in susceptibility.

(4) What are the most significant sources of toxic pollutants of concern in urban areas? How can the most critical sources be identified and their contribution to exposures and risk be quantified?

(5) How can monitoring and modeling (including emissions modeling, dispersion modeling, source apportionment modeling, and human exposure modeling) best be linked to estimate exposure and risk? How can the distribution of human exposures best be estimated for populations living and working near to identified point sources? What is the relationship of ambient monitoring to personal exposure? What atmospheric transformations occur that alter the toxicity of the urban HAPs?

(6) How can current dose-response assessment methods (e.g., single point NOAEL, Benchmark, categorical regression, Bayesian) be improved or supplemented to further reduce the use of defaults and reduce uncertainty in both cancer and noncancer (chronic and acute exposures) health effects assessments of urban HAPs.

Funding: About $2 million will be awarded in fiscal year 1999 in this program, subject to the availability of funds. Proposals in the $50,000 to $200,000/year range are encouraged. Duration of awards may be up to three years.

6. MERCURY: TRANSPORT AND FATE THROUGH A WATERSHED

Introduction: The Clean Air Act, as amended in 1990, required the U.S. EPA to prepare an assessment of the magnitude of U.S. mercury emissions by source, the health and environmental effects of the emissions, and the cost and availability of control technologies. The resulting report entitled *Mercury Study Report to Congress* (http://www.epa.gov/oar/mercover.html) describes our current understanding of mercury-related issues.

The *Mercury Study Report to Congress* identified mercury as a human health and environmental problem needing additional scientific and technical research. Other Agency reports (e.g., *Great Waters Second Report to Congress* – June 1997 [http://www.epa.gov/airprogm/oar/gr8water/index.html] and *Utility Air Toxics Report to Congress* – February 1998 [http://www.epa.gov/airlinks]) stress the adverse impacts of mercury on both humans and wildlife. Adverse effects on mammals, as well as fish and birds, include behavioral abnormalities, impaired growth and development, reduced reproductive success, and death. Fish consumption is the dominant pathway for exposure of humans and wildlife to mercury. Mercury poisoning, particularly in young children and fetuses, is a public health concern.

Mercury is a naturally occurring element that cycles between the atmosphere, land, and water. Anthropogenic emissions of mercury have increased significantly since the beginning of the industrial age. While mercury emissions from some sources have decreased, and mercury use in

paints and pesticides has been banned, the amount of biologically available mercury in the environment is still significant. In order to formulate science-based management strategies to better protect the health of humans and wildlife, a better understanding of the fate and transformation of mercury in the environment is needed. The goal of this solicitation is to develop a better understanding of terrestrial and aquatic fate and transformation processes (especially microbial) that mediate ecological and human exposures to mercury. The development of improved models of the fate of mercury in aquatic and terrestrial systems in order to estimate ecosystem response to decreased anthropogenic inputs of mercury is also needed.

Anthropogenic emissions are the largest contributor of biologically available mercury in the environment. Coal burning electric utilities, municipal waste incinerators, chlor-alkali plants, and commercial and industrial boilers are among the highest emitters of mercury into the environment. Mercury is released as mercury vapor and enters watersheds through air deposition (primarily wet deposition). It may also circulate around the globe and be transported thousands of miles from its point of emission. Within the United States the highest deposition rates are expected to occur in the southern Great Lakes, the Ohio River valley, the Northeast, and South Florida. Atmospheric deposition, however, is not the primary source of mercury contamination in all regions of the United States. Mercury residuals from mining operations and their transport through aquatic systems are of particular concern to western regions.

Through a series of complex chemical and physical transformations elemental mercury reacts in the environment to form inorganic mercury salts and methylmercury. Methylmercury is toxic and bioaccumulates in the tissues of fish consumed by humans and wildlife. Dietary methylmercury is almost completely absorbed into the blood and distributed to tissues while inorganic mercury is more readily eliminated from the body.

Objectives and Priorities: EPA is soliciting fundamental research on the complex chemical and physical transformations and movement of mercury through the environment. The outcome of this research will increase our ability to trace mercury from its entrance into the ecosystem through its biogeochemical cycling to the concentration of methylmercury in fish tissue. This will promote the development of risk management strategies based on sound science.

Specific objectives are the following:

(1) The performance of theoretical and laboratory investigations focused on understanding the behavior of mercury in the environment, including mercury cycling models; the role of biogeochemistry, especially mercury sulfide complexes; interactions among nutrients, carbon, and sulfur on methylation processes; the role of microorganisms; and the role of macrophytes, periphyton and their interactions with hydrological processes.

(2) The development and evaluation of biogeochemical models of the microbial transformations of mercury in ecosystems in order to interpret the sources and distributions of total mercury and methylmercury in terrestrial and aquatic systems.

(3) Investigation of hypotheses about the regional behavior of mercury, extrapolating microbiological and biogeochemical process data from experimental scales to ecologically meaningful scales and time periods.

EPA invites applications addressing the critical research questions highlighted below:

(1) For a given amount of mercury transported into a watershed, what is the predicted concentration of methylmercury in fish? How do mercury and methylmercury spatially distribute across the terrestrial and aquatic components of a watershed? What controls bioavailability of mercury in the food chain?

(2) What environmental and biochemical variables control transformation of mercury to methylmercury? What environmental variables control the reduction of divalent mercury to elemental mercury in soils, sediments, and surface waters?

(3) How does mercury cycling vary within different geographic regions of the U.S. (South Florida, Great Lakes, Northeast or West)? How might the variability be accounted for [resource types (wetlands), temperature regimes, microbial communities]?

Funding: Subject to the availability of funds, approximately $3 million is expected to be awarded in fiscal year 1999 in this program. Proposals in the $200,000 to $300,000/year range are encouraged. Duration of awards may be up to 3 years.

ELIGIBILITY

Academic and not-for-profit institutions located in the U.S., and state or local governments, are eligible under all existing authorizations. Profit-making firms are not eligible to receive grants from EPA under this program. Federal agencies, national laboratories funded by federal agencies (FFRDCs), and federal employees are not eligible to submit applications to this program and may not serve in a principal leadership role on a grant.

FFRDC employees may cooperate or collaborate with eligible applicants within the limits imposed by applicable legislation and regulations. They may participate in planning, conducting, and analyzing the research directed by the principal investigator, but may not direct projects on behalf of the applicant organization or principal investigator. The principal investigator's institution may provide funds through its grant from EPA to a FFRDC for research personnel, supplies, equipment, and other expenses directly related to the research. However, salaries for permanent FFRDC employees may not be provided through this mechanism.

Federal employees may not receive salaries or in other ways augment their agency's appropriations through grants made by this program. However, federal employees may interact with grantees so long as their involvement is not essential to achieving the basic goals of the grant.1 The principal investigator's institution may also subcontract to a federal agency to purchase unique supplies or services unavailable in the private sector. Examples are purchase of satellite data, census data tapes, chemical reference standards, analyses or instrumentation not available elsewhere, etc. A written justification for federal involvement by subcontract must be included in the application, along with an assurance from the federal agency involved which commits it to supply the specified service.

[1]EPA encourages interaction between its laboratory scientists and grant principal investigators for the purpose of exchanging information in research areas of common interest that may add value to their respective research activities. However, this interaction must be incidental to achieving the goals of the research under a grant. If the involvement should become substantial, i.e., essential to achieving these goals, then the award would become a cooperative agreement. Interaction that is "incidental" is not reflected in a research proposal and involves no resource commitments.

Potential applicants who are uncertain of their eligibility should contact Dr. Robert E. Menzer in NCERQA, phone (202) 564-6849, EMail: menzer.robert@epamail.epa.gov

Standard Instructions for Submitting an Application

This section contains a set of special instructions on how applicants should apply for an NCERQA grant. Proposed projects must be for research designed to advance the state of knowledge in the research areas described in this solicitation.

Sorting Codes

In order to facilitate proper assignment and review of applications, each applicant is asked to identify the topic area in which their application is to be considered. It is the responsibility of the applicant to correctly identify the proper sorting code. Failure to do so will result in an inappropriate peer review assignment. At various places within the application, applicants will be asked to identify this topic area by using the appropriate Sorting Code. The Sorting Codes correspond to the topic areas within the solicitation. The Sorting Codes and application deadlines for this solicitation are shown below:

Topic Area	Sorting Code	Due Date
Integrated Assessment of the Consequences of Climate Change	99-NCERQA-G1	January 21, 1999
Ecological Indicators	99-NCERQA-E1	February 4, 1999
Regional Scale Analysis and Assessment	99-NCERQA-F	January 21, 1999
Urban Air Toxics	99-NCERQA-H1	February 18, 1999
Mercury: Transport and Fate through a Watershed	99-NCERQA-J1	February 4, 1999

The Sorting Code must be placed at the top of the abstract (as shown in the abstract format), in Box 10 of Standard Form 424 (as described in the section on SF424), and should also be included in the address on the package that is sent to EPA (see the section on How to Apply).

The Application

The initial application is made through the submission of the materials described below. **It is essential that the application contain all the information requested and be submitted in the formats described.** If an application is considered for award, (i.e., after external peer review and internal review) additional forms and other information will be requested by the Project Officer. **The application should not be bound or stapled in any way.** The Application contains the following:

A. Standard Form 424: The applicant must complete Standard Form 424 (see attached form and instructions). This form will act as a cover sheet for the application and **should be its first page.** Instructions for completion of the SF424 are included with the form. The form must contain the original signature of an authorized representative of the applying institution. Please note that both the Principal Investigator and an administrative contact should be identified in Section 5 of the SF424.

B. Key Contacts: The applicant must complete the Key Contacts Form (attached) as the **second page** of the submitted application.

C. Abstract: The abstract is a very important document. Prior to attending the peer review panel meetings, some of the panelists may read only the abstract. Therefore, it is critical that the abstract accurately describe the research being proposed and convey all the essential elements of the research. Also, in the event of an award, the abstracts will form the basis for an Annual Report of awards made under this program. The abstract should include the following information, as indicated in the example format provided:

1. **Research Category and Sorting Code:** Enter the full name of the solicitation to which your application is submitted and use the correct code that corresponds to the appropriate RFA topic. (Be sure to substitute the appropriate code for the "**XX**" in 99-NCERQA-**XX**).

2. **Title:** Use the exact title as it appears in the rest of the application.

3. **Investigators:** Start with the Principal Investigator. Also list the names and affiliations of each co-investigator who will significantly contribute to the project.

4. **Institution:** List the name and city/state of each participating university or other applicant institution, in the same order as the list of investigators.

5. **Project Period:** Provide the proposed project dates.

6. **Project Cost:** Provide the total request to EPA for the entire project period.

7. **Project Summary:** This should summarize: (a) the **objectives** of the study (including any hypotheses that will be tested), (b) the experimental **approach** to be used (which should give an accurate description of the project as described in the proposal), (c) the **expected results** of the project and how it addresses the research needs identified in the solicitation, including the estimated improvement in risk assessment or risk management that will result from successful completion of the work proposed.

8. **Supplemental Keywords:** A list of suggested keywords is provided for your use. Do not duplicate terms already used in the text of the abstract.

D. Project Description: This description must not exceed fifteen (15) consecutively numbered (center bottom), 8.5x11-inch pages of single-spaced standard 12-point type with 1-inch margins. The description must provide the following information:

1. **Objectives:** List the objectives of the proposed research and the hypotheses being tested during the project and briefly state why the intended research is important. This section can also include any background or introductory information that would help explain the objectives of the study (one to two pages recommended).

2. **Approach:** Outline the methods, approaches, and techniques that you intend to employ in meeting the objective stated above (five to 10 pages recommended).

3. **Expected Results or Benefits:** Describe the results you expect to achieve during the project, the benefits of success as they relate to the topic under which the proposal was submitted, and the potential recipients of these benefits. This section should also discuss the utility of the research project proposed for addressing the environmental problems described in the solicitation (one to two pages recommended).

4. **General Project Information:** Discuss other information relevant to the potential success of the project. This should include facilities, personnel, project schedules, proposed management, interactions with other institutions, etc. (one to two pages recommended).

5. **Important Attachments:** Appendices and/or other information may be included but must remain within the 15-page limit. References cited are in addition to the 15 pages.

E. Resumes: The resumes of all principal investigators and important co workers should be presented. Resumes must not exceed two consecutively numbered (bottom center), 8.5x11-inch pages of single-spaced standard 12 point type with 1-inch margins for each individual.

F. Current and Pending Support: The applicant must identify any current and pending financial resources that are intended to support research related to that included in the proposal or which would consume the time of principal investigators. This should be done by completing the appropriate form (see attachment) for each investigator and other senior personnel involved in the proposal. Failure to provide this information may delay consideration of your proposal.

G. Budget: The applicant must present a detailed, itemized budget for the entire project. This budget must be in the format provided in the example (see attachment) and not exceed two consecutively numbered (bottom center), 8.5x11-inch pages with 1-inch margins. Please note that institutional cost sharing is not required and, therefore, does not have to be included in the budget table. If desired, a brief statement concerning cost sharing can be added to the budget justification.

H. Budget Justification: This section should describe the basis for calculating the *personnel, fringe benefits, travel, equipment, supplies, contractual support,* and *other* costs identified in the itemized budget and explain the basis for their calculation (special attention should be given to explaining the *travel, equipment,* and *other* categories). This should also include an explanation of how the indirect costs were calculated. This justification should not exceed two consecutively numbered (bottom center), 8.5x11-inch pages of single-spaced standard 12-point type with 1-inch margins.

I. Quality Assurance Narrative Statement: For any project involving data collection or processing, conducting surveys, environmental measurements, and/or modeling, provide a statement on how quality processes or products will be assured. This statement should not exceed two consecutively numbered, 8.5x11-inch pages of single-spaced standard 12-point type with 1-inch margins. This is in addition to the 15 pages permitted for the Project Description. The Quality Assurance Narrative Statement should, for each item listed below, either present the required information or provide a justification as to why the item does not apply to the proposed research. For awards that involve environmentally related measurements or data generation, a quality system that complies with the requirements of ANSI/ASQC E4, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," must be in place.

1. The activities to be performed or hypothesis to be tested (reference may be made to the specific page and paragraph number in the application where this information may be found); criteria for determining the acceptability of data quality in terms of precision, accuracy, representativeness, completeness, comparability.

2. The study design, including sample type and location requirements and any statistical analyses that were used to estimate the types and numbers of samples required for physical samples or similar information for studies using survey and interview techniques.

3. The procedures for the handling and custody of samples, including sample identification, preservation, transportation, and storage.

4. The methods that will be used to analyze samples or data collected, including a description of the sampling and/or analytical instruments required.

5. The procedures that will be used in the calibration and performance evaluation of the sampling and analytical methods used during the project.

6. The procedures for data reduction and reporting, including a description of statistical analyses to be used and of any computer models to be designed or utilized with associated verification and validation techniques.

7. The intended use of the data as they relate to the study objectives or hypotheses.

8. The quantitative and or qualitative procedures that will be used to evaluate the success of the project.

9. Any plans for peer or other reviews of the study design or analytical methods prior to data collection.

ANSI/ASQC E4, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" is available for purchase from the American Society for Quality Control, phone 1-800-248-1946, item T55. Only in exceptional circumstances should it be necessary to consult this document. There are EPA requirements (R series) and guidance (G-series) documents available for potential applicants which address in detail how to comply with ANSI/ASQC E4. These may be found on the Internet at es.epa.gov/ncerqa/qa/qa_docs.html. R-5, "EPA Requirements for Quality Assurance Project Plans," and G-4, "Guidance for the Data Quality Objectives Process," are particularly pertinent to this RFA's QA requirements."

J. Postcard: The Applicant must include with the application a self addressed, stamped 3x5-inch post card. This will be used to acknowledge receipt of the application and to transmit other important information to the applicant.

How to Apply

The original and ten (10) copies of the fully developed application and five (5) additional copies of the abstract (15 in all), must be received by NCERQA no later than **4:00 P.M. EST** on the closing date assigned to the topic area appropriate to the application (**see Sorting Codes section**):

The application and abstract must be prepared in accordance with these instructions. Informal, incomplete, or unsigned proposals will not be considered. The application should not be bound or stapled in any way. The original and copies of the application should be secured with paper or binder clips. Completed applications should be sent via regular mail to:

U.S. Environmental Protection Agency
Peer Review Division (8703R)
Sorting Code: 99-NCERQA-**XX**
(replace the "XX" with the appropriate code)
401 M Street, SW
Washington DC 20460

For express mail or courier-delivered applications, the following address must be used:

U.S. Environmental Protection Agency
Peer Review Division (8703R)
Sorting Code: 99-NCERQA-**XX**
(replace the "XX" with the appropriate code)
1300 Pennsylvania Avenue, NW
Room B-10105
Washington, DC 20004

Phone: (202) 564-6939 (for express mail applications)

The sorting code must be identified in the address (as shown above).

Guidelines, Limitations, and Additional Requirements

Proposals must be submitted to only one topic area, using a single sorting code. Proposals submitted to more than one RFA topic will be assigned to the topic designated on the first version received or to the first sorting code designated on the application. If you wish to submit more than one application, you must ensure that the research proposed is significantly different from any other that has been submitted to this solicitation or from any other grant you are currently receiving from EPA or any other federal government agency.

Projects which contain subagreements or subcontracts constituting more than 40% of the total direct cost of the grant for each year in which the subcontract is awarded will be subject to special review and may require additional justification.

Researchers will be expected to budget for and participate in an annual All Investigators Meeting with EPA scientists and other grantees to report on research activities and to discuss issues of mutual interest.

Review and Selection

All grant applications are initially reviewed by EPA to determine their legal and administrative acceptability. Acceptable applications are then reviewed by an appropriate technical peer review group. This review is designed to evaluate each proposal according to its scientific merit. In general, each review group is composed of non-EPA scientists, engineers, social scientists, and/or economists who are experts in their respective disciplines and are proficient in the technical areas they are reviewing. The reviewers use the following criteria to help them in their reviews:

1. The originality and creativity of the proposed research, the appropriateness and adequacy of the research methods proposed, and the appropriateness and adequacy of the Quality Assurance Narrative Statement. Is the research approach practical and technically defensible, and can the project be performed within the proposed time period? Will the research contribute to scientific knowledge in the topic area of the solicitation? Is the proposal well prepared with supportive information that is self-explanatory and understandable?

2. The qualifications of the principal investigator(s) and other key personnel, including research training, demonstrated knowledge of pertinent literature, experience, and publication records. Will all key personnel contribute a significant time commitment to the project?

3. The availability and/or adequacy of the facilities and equipment proposed for the project. Are there any deficiencies that may interfere with the successful completion of the research?

4. The responsiveness of the proposal to the research needs identified for the topic area. Does the proposal adequately address all of the objectives specified for this topic area?

5. Although budget information is not used by the reviewers as the basis for their evaluation of scientific merit, the reviewers are asked to provide their view on the appropriateness and/or adequacy of the proposed budget and its implications for the potential

success of the proposed research. Input on requested equipment is of particular interest.

Applications that receive scores of excellent and very good from the peer reviewers are subjected to a programmatic review within EPA, the object being to assure a balanced research portfolio for the Agency. Scientists from the ORD Laboratories and EPA Program and Regional Offices review these applications in relation to program priorities and their complementarity to the ORD intramural program and recommend selections to NCERQA.

Funding decisions are the sole responsibility of EPA. Grants are selected on the basis of technical merit, relevancy to the research priorities outlined, program balance, and budget. A summary statement of the scientific review by the peer panel will be provided to each applicant. Customarily, applicants are notified about award decisions within 6 months of the application deadline.

Applications selected for funding will require additional certifications, possibly a revised budget, and responses to any comments or suggestions offered by the peer reviewers. Project Officers will contact Principal Investigators to obtain these materials.

Proprietary Information

By submitting an application in response to this solicitation, the applicant grants EPA permission to share the application with technical reviewers both within and outside of the Agency. Applications containing proprietary or other types of confidential information will be returned to the applicant without review.

Funding Mechanism

The funding mechanism for all awards issued under this solicitation will consist of grants from EPA and depends on the availability of funds. In accordance with Public Law 95-224, the primary purpose of a grant is to accomplish a public purpose of support or stimulation authorized by Federal statute rather than acquisition for the direct benefit of the Agency. In issuing a grant agreement, EPA anticipates that there will be no substantial EPA involvement in the design, implementation, or conduct of the research funded by the grant. However, EPA will monitor research progress, based in part on annual reports provided by awardees.

Contacts

Additional general information on the grants program, forms used for applications, etc., may be obtained by exploring our Web page at **www.epa.gov/ncerqa**. EPA does not intend to make mass-mailings of this announcement. Information not available on the Internet may be obtained by contacting:

U.S. Environmental Protection Agency
National Center for Environmental Research and Quality Assurance (8703R)
401 M Street, SW
Washington DC 20460

Phone: 1-800-490-9194

In addition, a contact person has been identified below for each topic within the RFA. These individuals will usually be the Project Officers for the grants funded under a particular topic. They will respond to inquiries regarding the solicitation and can respond to any technical questions related to your application.

Integrated Assessment of the Consequences of Climate Change

- Barbara Levinson
  202-564-6911
  levinson.barbara@epa.gov

Ecological Indicators

- Barbara Levinson
  202-564-6911
  levinson.barbara@epa.gov

Regional Scale Analysis and Assessment

- Barbara Levinson
  202-564-6911
  levinson.barbara@epa.gov

Urban Air Toxics

- Deran Pashayan
  202-564-6913
  pashayan.deran@epa.gov

Mercury: Transport and Fate through a Watershed

- Barbara Levinson
  202-564-6911
  levinson.barbara@epa.gov